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tozoa, one with and one without a sex chromosome; and that if a spermatozoon of the former type enters an egg a female is produced. Since in artificial parthenogenesis no sex chromosome is introduced the parthenogenetic frogs should be males.

It will be of further interest to find out whether the spermatozoa of such frogs when used for the fertilization of eggs will give rise to normal offspring and to both sexes and it is my intention to carry the experiments if possible to a decision of this question. It is further of interest to study the number and nature of chromosomes in the spermatozoa of the parthenogenetic frogs.

[Since the proof of this paper was read, another of the parthenogenetic frogs died, at the age of thirteen months. It was also a male, possessing well developed testicles of more than 1 mm. in diameter, and the typical pads on the thumb of the forelegs characteristic of the male.]

¹ Loeb, J., *Amer. J. Physiol.*, **3**, 135 (1899); **3**, 434 (1900).

² Loeb, *Artificial Parthenogenesis and Fertilization*, Chicago, 1913.

³ Delage, Y., *Paris, C. R. Acad. Sci.*, **148**, 453 (1909).

⁴ Loeb, J., and Bancroft, F. W., *J. Exp. Zool.*, **14**, 275 (1913); **15**, 379 (1913).

⁵ Dr. Uhlenhuth was kind enough to do this for me.

DE VRIESIAN MUTATION IN THE GARDEN BEAN, *PHASEOLUS VULGARIS*

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Received by the Academy, April 25, 1916

The extensive experience of experimental breeders with *Phaseolus vulgaris* during the past fifteen years has yielded few cases of unquestionable de Vriesian mutation. Such seems the most logical explanation of the origin of a race now under cultivation at the Station for Experimental Evolution.

Among the plants which survived from a lot of 4286 morphological aberrant plants secured in a study of 238,015 seedlings in 1912 were 9 which were distinguished from the remainder by producing only highly abnormal offspring in 1913. Practically without exception the 8000 first, second and third generation offspring produced in 1913, 1914 and 1915 were of a similar morphologically aberrant type. The same is true of a smaller culture of fourth generation plants grown in the greenhouse in 1915.

In this race the whole morphological organization of the seedling has apparently been changed. The new race is also characterized by a high degree of variability.

The axis may be either round and slender throughout or considerably broadened, or even divided. Of the plants about 30% show division of the epicotyl into two or more branches; about 50% are recorded as producing shoots from the axils of the cotyledons.

The race is characterized most specifically by the doubling of the number of cotyledons and primordial leaves. The most frequent number of cotyledons is four, instead of two as is normal in the species.

Leaves.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Cotyledons	2	—	2	11	3	8	5	2	1	1	—	—	—	—	—	33
	3	3	20	69	95	74	36	28	18	4	3	2	—	—	—	352
	4	7	51	114	187	140	97	55	38	24	13	7	—	—	1	734
	5	1	1	7	12	14	20	4	5	3	4	1	1	—	—	73
	6	—	—	—	1	2	—	2	3	—	—	—	1	—	—	9
	7	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
		11	74	201	298	238	158	92	65	32	20	10	2	—	1	1202

The average number is somewhat less than four. The modal number of primordial leaves is also four, but the average number is considerably higher than this number.

The range of variation in number of cotyledons and of primordial leaves is very wide. The table, which gives the frequency of the various combinations of cotyledon and leaf number in several hundred seedlings studied in 1915, shows that plants with from 2 to 7 cotyledons and with from 1 to 14 primordial leaves were observed. These distributions show a variation of about 20% of the mean for number of cotyledons and of about twice that amount for number of leaves. The most frequent combination is that of four cotyledons and four primordial leaves, but the range of combinations is very wide, and correlation in consequence very low.

Variation in the new race is not limited to number of organs, but is conspicuous in the structure of cotyledons and leaves as well as of the axis. The most of the cotyledons are large and typical in form but occasionally those which are small and scale-like are observed. They may be inserted in a regular whorl or widely scattered along the axis. The leaves vary greatly in insertion, size, form and texture. Foliar ascidia are abundant.

History of origin and morphological characteristics are discussed and fully analyzed statistically in a paper appearing in an anniversary volume of the *Memoirs of the New York Botanical Garden*.